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Ingestion of multiple magnets: The count does matter

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ABSTRACT

Ingestion of multiple magnets poses a particular risk for various intraabdominal complications in children. We herein report a case of ingestion of multiple magnets, of which 3 were spontaneously expelled, and the remaining magnets were surgically removed. Since the total amount of ingestion was unknown upon presentation and the remaining intraabdominal magnets failed to pass after 24 h, emergency surgery was performed. Two magnets sandwiched the bowel walls and formed a jejunoileal fistula. There was no peritoneal contamination. We found that not all the ingested multiple magnets attracted each other, and multiple magnets could appear as single material on a plain radiograph. Confirming the exact count of ingested magnets is important; if the count is in doubt or two or more attachments are evident, prompt surgical intervention is warranted.

Ingestion of multiple magnets poses a significant health risk in children, especially in children younger than 3 years of age or in children with psychological or developmental problems [1]. In general, ingested foreign bodies such as a single magnet usually pass spontaneously and do not cause serious complications that require surgical intervention. However, if multiple ingested magnets attract each other through bowel walls, bowels that become sandwiched between magnets can rapidly show pressure necrosis with perforation, fistula formation, or intestinal obstruction [2]. There has been debate on the timing and treatment of choice for multiple ingested magnets, from prompt surgical intervention to initial close monitoring [3,4]. We herein report a case of a 9-month old baby who ingested an unknown number of multiple magnets and discuss the timing and options for treatment of ingestion of multiple magnets.

1. Case report

A 9-month old female infant presented with a foreign body in her morning stool. The foreign body turned out to be a magnetic paper holder, and the patient passed two more magnets of similar shape that afternoon. Parents were not sure of the total amount of ingested magnets. On physical examination, her abdomen was soft and flat, and there was no evidence of peritoneal irritation. An abdominal X-ray revealed a metallic foreign body in her lower abdomen, and serial X-rays showed up and down movements in abdomen (Fig. 1 A, B). Gastroscopy confirmed that the magnets had already passed the pylorus. As the total count of ingested magnets was uncertain and the shape (thickness and size) of ingested magnets was different to each other, we were not convinced that there were multiple attached intraabdominal magnets or a single magnet. The patient failed to pass the material after 24 h of observation and, although there were no signs or symptoms of intestinal complications, emergency surgery was performed. There was no peritoneal contamination, and two parts of the small bowel 60 cm and 215 cm proximal to the ileocecal valve were found to form a jejunoileal fistula. The sandwiched bowel walls had nearly disappeared, suggesting pressure necrosis (Fig. 2A, B). The segments involved were resected, and end-to-end anastomosis was performed. The postoperative course was uneventful.

2. Discussion

Overall, this patient ingested five magnets, and three of them passed spontaneously. The remaining two magnets were attracted to each other and eventually led to the formation of a jejunoileal fistula within 24 h. This case tells us that not all ingested multiple

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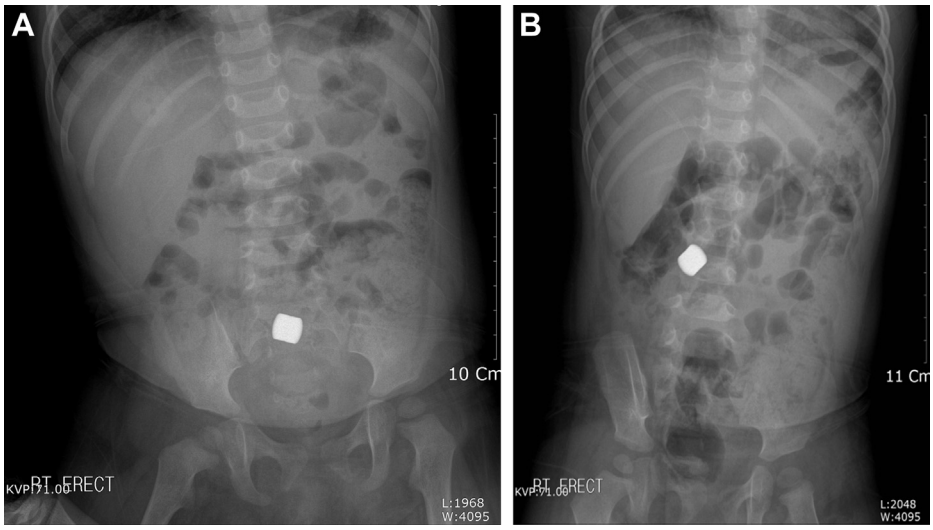

Fig. 1. (A, B) Abdominal X-ray shows a metallic foreign body moving up and down in serial follow-up. It is uncertain whether the foreign body is a single magnet or attached multiple magnets.

magnets attract each other and suggests two different approaches to treatment. If the number of magnets ingested is known, the magnets present beyond the pylorus, and the magnets move separately on serial X-rays, the plan should be close observation. However, if either the total count is uncertain or the magnets attach to each other, laparotomy should be performed to prevent further complications. In our case, the intraabdominal material moved freely up and down in the abdominal cavity, thus mimicking a single magnet on peristaltic movement. This might be explained by an 'en bloc' movement of the intestinal conglomerate. Butterworth and Feltis reported a similar case in which five magnets attached in series were mistaken on a plain radiograph for a single, rod-like magnet [5]. As we had no definite clues to the total ingested count, emergency surgery was performed in the absence of intra-abdominal complications and confirmed two magnets that appeared as a single magnet.

Some authors advocate the policy of delaying surgery until signs of peritoneal complications occur. Indeed, two magnets that have been placed together intentionally have been used for various therapeutic purposes such as in nonsurgical intestinal anastomosis [6]. In this case, if left untreated, the inadvertently formed jejunoileal fistula might have played a role as an exit through which the magnets could pass without causing peritonitis, and the treatment would seem successful. However, blind loop syndrome is a well-documented complication following side-to-side bypass of the intestine [7]. Moreover, we have fewer studies on the long-term sequela of small-to-small bowel fistulas formed during infancy. Therefore, a just 'wait and see' policy in the absence of abdominal complications cannot always be justified.

Most abdominal symptoms have been known to occur between 1 and 7 days after ingestion of multiple magnets, and our findings are consistent with the literature [2,8]. The bowel walls that were compressed between the two magnets had nearly disappeared after the first 24 h due to pressure necrosis, and this might have resulted in intestinal leakage and panperitonitis. Moreover, recently engineered magnets containing iron, boron, and neodymium powders are five to 10 times stronger than plain iron magnets [9]. Therefore, if surgical intervention is under consideration, it should be undertaken as early as possible to prevent further complications.

Tavarez et al. recently suggested an algorithm for evaluation of the pediatric patient who has had ingestion of a magnetic foreign body [10], and our experience is relatively in agreement with this algorithm. These authors emphasize the importance of symptom development after ingestion of multiple magnets. However, this algorithm seems to underestimate the possibility, although dim, of spontaneous expulsion of multiple magnets. As seen in our case, not all the ingested multiple magnets are involved in symptom development, and also the absence of symptoms does not guarantee the

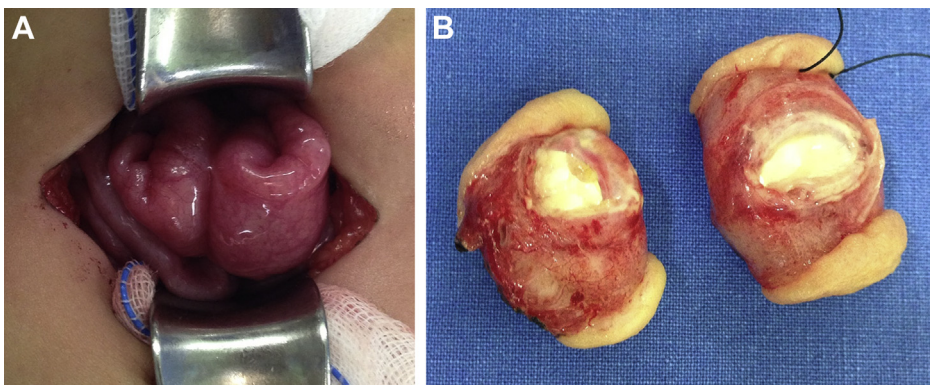

Fig. 2. (A) Operative findings. A segment of jejunum and ileum were attracted to each other, forming a spontaneous jejunoileal fistula. (B) Sandwiched walls between two magnets had nearly disappeared, suggesting a pressure necrosis.

absence of complications such as a fistula formation. Therefore, we also emphasize the importance of acquiring correct information on the number of magnets ingested to decide the most relevant treatment plan.

3. Conclusion

Multiple ingested magnets can be expected to pass spontaneously if the clinician is certain of the count and the magnets move separately on serial X-rays. Under circumstances in which the count ingested is uncertain or the magnets have already attached, prompt surgical intervention should be initiated.

Conflicts of interest

There was no conflict of interest.

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